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EVALUATION OF PITCH CANKER IN THE OUACHITA SEED ORCHARD MT. IDA, ARKANSAS 1983

Dale A. Starkey[1/]
Stephen A. Covington[2/]

Abstract

A survey of randomly selected rows in a shortleaf pine seed orchard revealed a low level (5.3% incidence) of pitch canker disease. Greatest incidence occurred in the East Ouachita seed source, where the greatest proportion of clones were affected. Damage on diseased ramets in this source was also slightly greater than for other sources.

INTRODUCTION

Pitch canker of southern pines, caused by the fungus Fusarium moniliforme Sheld var. subglutinans Wr. and Reink. is an intermittently damaging disease of forest stands (Blakeslee and Oak 1979, Phelps and Chellman 1976), seed orchards (Dwinell and others 1977, Phelps and Chellman 1976) and forest nurseries (Barnard and Blakeslee 1980). The fungus enters the tree through wounds and can be vectored by insects (Blakeslee et al. 1980). Potential to damage flowers, cones, and seed has been demonstrated for slash and loblolly pines (Miller and Bramlett 1979).

Many species of southern pine are susceptible to pitch canker. Slash shortleaf and Virginia pine are highly susceptible. Loblolly is less susceptible (Dwinell 1978). Most research work has been performed on slash and loblolly pine in plantations and seed orchards.

Effects of pitch canker outbreaks in southern pine seed orchards are not yet fully understood. In addition to shoot damage, reduced cone/seed production has been reported by some (Dwinell and others 1977), while bumper cone crops have occurred during a pitch canker outbreak (Kuhlman and others 1982).

1/ Plant Pathologist, USDA Forest Service, Region 8, State and Private Forestry, Alexandria Field Office, Pineville, LA 71360.

2/ Biological Technician, USDA Forest Service, Region 8, State and Private Forestry, Alexandria Field Office, Pineville, LA 71360.

Clonal variation in susceptibility is known to exist in loblolly pine (Kuhlman and others 1982; Kelly and Williams 1982) and slash pine (Phelps and Chellman 1976).

The most serious effect of a pitch canker outbreak in a seed orhcard may not be shoot mortality but the reduction in cone and seed yield and the reduction in seed quality in highly susceptible clones.

A noticeable amount of dieback in recent years on shortleaf pine in the Ouachita Seed Orchard (Ouachita National Forest), Mt. Ida. AR. prompted this investigation. Samples of dead and dying shoot and branch tissue taken in June 1982 revealed the presence of the pitch canker fungus in symptomatic tissue. A brief survey was made in August 1982 by visually rating 285 trees for characteristic pitch canker symptoms. Fifty-seven randomly selected clusters of 5 trees each were rated for disease activity. Seven percent of these trees (East Ouachita seed source) had symptoms of pitch canker.

OBJECTIVES

The purpose of this evaluation was to determine the incidence and severity of pitch canker in the Ouachita Seed Orchard, document any differences in disease incidence or severity among seed sources and rank clones according to their susceptibility to pitch canker within seed sources.

METHODS

Thirty-five randomly selected rows were surveyed in the entire orchard (approximately 810 rows). A row was defined as a length containing the original planting spaces of all 50 clones. The number of rows surveyed was sufficient to generate a confidence level of 95% and a relative error of .10 based on the assumption that 50% of all ramets are still in place. Sample rows were allocated to the seed source blocks in proportion to their size resulting in 11 rows in East Ouachita, 8 rows in West Ouachita, 9 in Ozark and 7 in Missouri being sampled. Ramets were observed from both sides of the tree by two observers and typical pitch canker symptoms were jointly rated by the following rating systems (the first is modified from Kuhlman and others 1982, the second devised for this survey by us).

Rating K

1 = None
2 = 1 - 3 lateral branches
3 = terminal
4 = terminal and 1 - 3 lateral branches
5 = 5 - 10 branches
6 = > 10 branches < 50% of crown
7 = > 50% of crown
8 = dead due to PC

Rating F

1 = None
2 = 1 - 10% diseased
3 = 11 - 20%
4 = 21 - 30%
5 = 31 - 40%
6 = 41 - 50%
7 = > 50%
8 = dead

RESULTS AND DISCUSSION

Distribution of the 35 sample rows is illustrated in figure 1. Overall pitch canker incidence in the orchard was found to be low (5.3%, table 1). The greatest incidence was found in the East Ouachita seed source (8.9%), the least in Missouri (3.2%). The greatest proportion of clones affected also occurred in the East Ouachita (36%) with the least in Ozark (10%). For the entire orchard, 19.5% of all clones were affected.

Average damage to infected ramets tended to be light. Severity ratings varied little using the F system and affected clones in all sources averaged a rating of about 2.0 (< 10% diseased) for infected ramets. The K rating caused slightly more separation with East Ouachita being most severely damaged (average rating 3.2). Least damaged was Missouri with a rating of 2.3. Some individual ramets were heavily damaged. Of the ramets in East Ouachita with pitch canker, 16% had severity ratings above 3 for the F rating (> 20% diseased).

A list of diseased clones in each seed source is found in table 2. Greatest incidence occurred in clones 6 and 39 in East Ouachita; clone 15 in West Ouachita; clone 14 in Ozark; and clone 50 in Missouri. These incidence figures must, however, be viewed as general indicators only, since some clones were represented in the survey by a very limited number of ramets. Hence, some disease levels may be overestimated while others have been undetected. Susceptibility groups were assigned by examining the results of a Duncan's multiple range test on disease incidence in 3 orchards and utilizing natural "groupings" at the P = .01 level.

In addition, since disease levels in the orchard were low, the relative susceptibility or resistance of clones (table 2) may not have been fully expressed. Had the orchard been more heavily diseased, some clones with apparent resistance might have sustained infections while others might have remained unaffected, more accurately expressing true resistance.

The effect of pitch canker infection on cone and seed yield in the orchard is currently unknown. However, since incidence is rather low it is probably minor at the present time. Yields of individual, heavily damaged trees may have been affected but the number of such trees is very small.

The source of wounding which allows the pathogen entrance to the tree is not known. Cones scars were observed to have been the infection court in several cases but are judged to be of minor importance. Presence of deodar weevil damage was also noted but not in extreme abundance.

Since incidence is low and damage mostly light, roguing and pruning should serve to remove severely damaged trees and limbs from the orchard (Blakeslee et.al. 1980). This should reduce the level of inoculum of the fungus and aid in limiting further infection. Any future increase in top dieback or other symptoms should be promptly reported to Forest Pest Management in Pineville, LA.

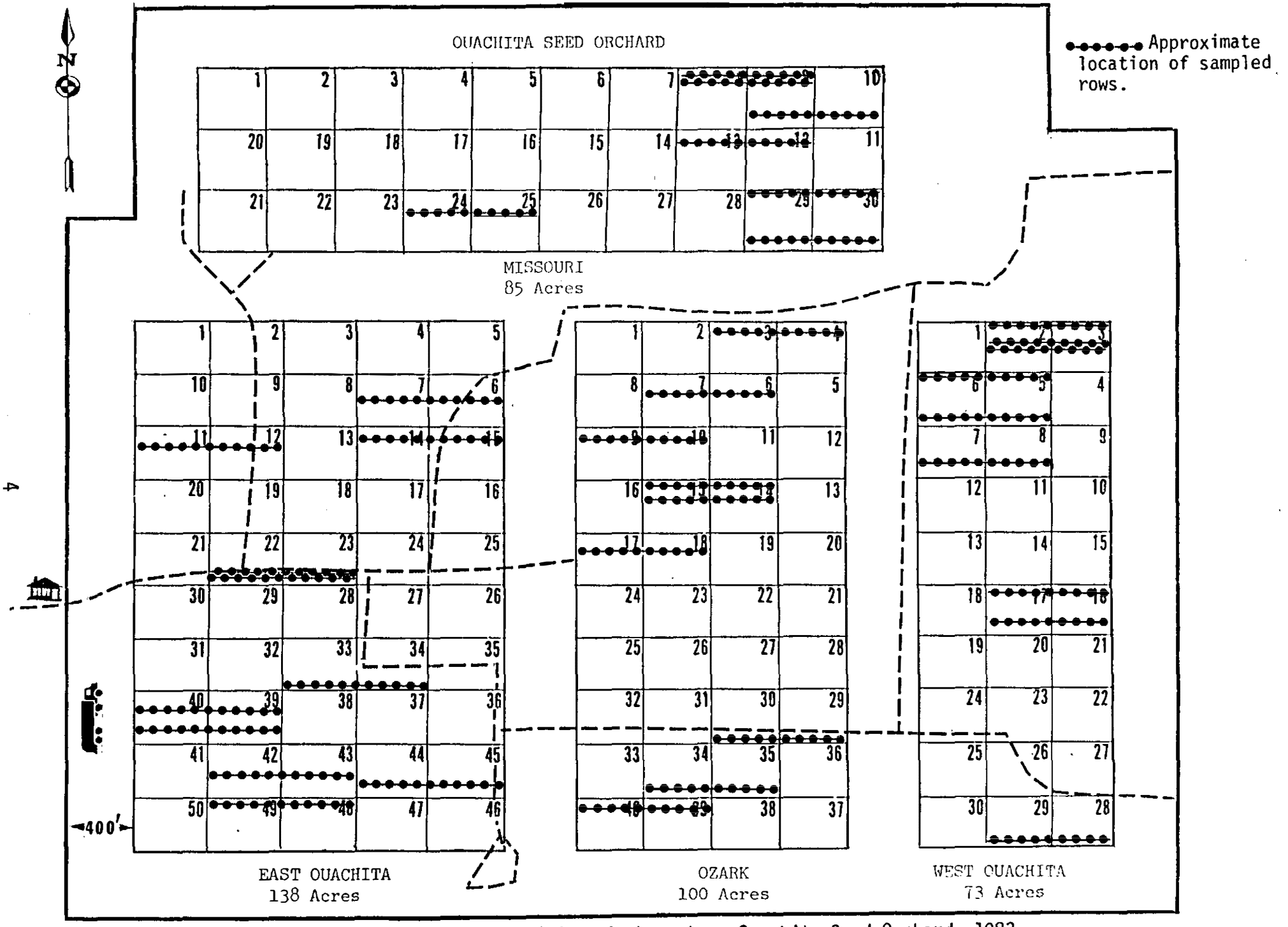

Figure 1. Approximate location of rows sampled for pitch canker, Ouachita Seed Orchard, 1983.

Table 1. Incidence (percent of trees infected) and severity of pitch canker by seed source in the Ouachita Seed Orchard, 1983.

Seed Source	Incidence	$\bar{x}$ Severity K	$\bar{x}$ Severity F	% Clones Infected
E. Ouachita	8.9	3.2	2.2	36
W. Ouachita	5.8	2.7	2.1	20
Missouri	3.2	2.3	2.0	12
Ozark	3.0	2.9	2.1	10
Total	5.3	2.9	2.1	19.5

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Table 2. Incidence (percent of trees infected) of pitch canker by clone and seed source in the Ouachita Seed Orchard, 1983.

	E. Ouachita		W. Ouachita		Ozark		Missouri	
	Clone	Incidence	Clone	Incidence	Clone	Incidence	Clone	Incidence
Susceptible	6	40	15	50	14	40	50	50
	39	40	29	33.3	6	33.3	46	33.3
	33	37.5	46	33.3	10	33.3		
	18	33.3						
Moderately Susceptible	17	28.6	5	25	11	25	26	25
	40	28.6	8	25			43	25
	15	25	1	20				
	43	25						
	44	22.2						
	16	20						
Slightly Susceptible	1	16.7	10	16.7	40	12.5	27	14.3
	19	16.7	42	16.7			40	12.15
	20	16.7	3.5	12.5				
	47	16.7						
	30	14.3						
	14	12.5						
	27	12.5						
	10	11.1						

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Prepared by: Dale Starkey
Pathologist

Stephen A. Cornelius
Biological Technician

Approved by:
for HARVEY V. TOKO
Staff Director
Forest Pest Management

SOUTHERN REGION, STATE AND PRIVATE FORESTRY
USDA, FOREST SERVICE, ATLANTA, GA 30367